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EXAMINER	
UMEZ ERONINI, LYNETTE T	
ART UNIT	**PAPER NUMBER**
1765	14

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/800,495	HIROSE ET AL.	
	Examin r	Art Unit	
	Lynette T. Umez-Eronini	1765	

-- Th MAILING DATE of this communication appears on the cover sh et with the correspond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,9-20 and 25-28* is/are pending in the application.

4a) Of the above claim(s) *12-17 and 25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,9-11,18-20 and 24-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 1 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu (US 5,910,846) in view of Aiyer et al. (US 5,838,448).

Sandhu teaches, ". . . a method and apparatus that detects the endpoint of CMP processing at critical areas on the surface of a semiconductor wafer" (column 3, lines 48-50). Different wavelengths of light may be used such that the intensity of reflected light may be measured a different wavelengths to get a more reliable signature of the material." (column 6, lines 15-18). " . . . the . .. spectrometer suitably detects a change in intensity of the reflected beam. . " (column 6, lines 40-42). The above reads on,

A method of detecting an endpoint of polishing processing, comprising the step of:

simultaneously irradiating onto a film formed on a surface of a wafer having different wavelengths from one anther;

detecting reflected lights of different wavelengths form said film caused by the irradiation with the lights of the different wavelengths; and

detecting the endpoint of polishing processing of said film on the basis of a relationship between intensities of the detected reflected lights of the different wavelengths, **as in claim 1**.

Sandhu differs in failing to teach detecting an endpoint of polishing processing on a surface of a wafer under polishing processing, **in claim 1**; wherein said light is a white light provides the lights of the different wavelengths, **in claim 18**; and the endpoint is detected on the basis of a spectral intensity of the detected reflected lights of the different wavelengths, **in claim 19**.

Aiyer teaches, " . . . detecting thin film thickness or thickness change during CMP use thin film reflectance variations caused by a change in the incidence angle of the incident light (column 2, lines 63-66), which supports endpoint detection of a wafer under a polishing processing. Aiyer also teaches, ". . . a different wavelength, for example, in the visible spectrum is used)" (column 3, lines 41-44), which reads on, white light provides the lights of the different wavelengths and the endpoint is detected on the basis of a spectral intensity of the detected reflected lights of the different wavelengths, **in claim 19.**

It is the examiner position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu by using Aiyer's detection method for the purpose of improving insitu sensing of thin film thickness during CMP, providing enhanced detection sensitivity over a wide range of film thicknesses (Aiyer, column 2, lines 6-9).

Sandhu further teaches a cmp detection endpoint method based on comparing the actual intensity of the reflected light beam **86** with an expected intensity at the endpoint of the CMP process (column 6, lines 43-58), which reads on,

said endpoint of polishing processing is detected on the basis of an intensity ratio of said detected reflected lights of different wavelengths, **in claim 2**.

3. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu (US '846) in view of Aiyer (US '448) as applied to claim 1 above, and further in view of Birang (US 5,964,643).

Sandhu in view of Aiyer differs in failing to teach irradiating the surface of said wafer under polishing processing with a UV light and detecting a UV light reflected on the surface of said wafer by the irradiation.

Birang teaches a method of directing a light beam toward the layer during polishing and monitoring the light reflecting off the substrate (Abstract) and employing a wavelength anywhere from the far infrared to ultraviolet (column 17, lines 45-47), which reads on, irradiating the surface of said wafer under polishing processing with a UV light and detecting a UV light reflected on the surface of said wafer by the irradiation.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu in view of Aiyer by using UV light as taught by Birang for the purpose of removing less material during a polishing cycle (column 17, lines 52-60).

4. Claims 9, 24, 26, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu ('846) in view of Aiyer ('388), and further in view of Woo (WO 99/30109), Pollock (US 5,770,521) and Cadien et al. (US 5,954,975).

As pertaining to claims 9 and 25, Sandhu teaches, ". . . a method and apparatus that detects the endpoint of CMP processing on a semiconductor wafer in which a lower layer of material with a first reflectivity is positioned under an upper layer of material with a second reflectivity (Abstract, and **FIG. 2**). Different wavelengths of light may be used such that the intensity of reflected light may be measured a different wavelengths to get a more reliable signature of the material." (column 6, lines 15-18). ". . . the . . . spectrometer suitably detects a change in intensity of the reflected beam . . ." (column 6, lines 40-42). The above reads on,

A method of manufacturing a semiconductor device, comprising the steps of:

forming an insulating film on a surface of a wafer;

attaching the wafer having the insulating film formed on the surface to a polishing processing machine; and

starting polishing processing of the wafer attached to the polishing processing machine;

simultaneously irradiating onto a film formed on a surface of a wafer having different wavelengths from one another; and

detecting respective reflected lights of different wavelengths from the insulating film on said wafer caused by the irradiation with the lights of the different wavelengths;

Sandhu further teaches, "The final step **150** of the method is to compare the actual intensity of the reflected beam **86** with an expected intensity at the endpoint of the CMP process" (column 6, lines 49-51), which reads on,

detecting the endpoint of polishing processing on the film by comparing at least an intensity of the detected reflected lights of the different wavelengths, **in claim 9** and by comparing at least an intensity of the detected reflected lights of the different wavelengths includes detecting on the basis of a relationship between intensities of the detected reflected lights of the different wavelengths, **in claim 24**; and

wherein the detecting an endpoint of polishing processing is detected on the basis of an intensity ratio of the detected reflected lights of different wavelengths, **in claim 26**.

Sandhu differs in failing to teach detecting an endpoint of polishing processing on a surface of a wafer under polishing processing, **in claim 9**; and wherein a white light provides the lights of the different wavelengths, **in claim 27**.

Aiyer teaches, " . . . detecting thin film thickness or thickness change during CMP use thin film reflectance variations caused by a change in the incidence angle of the incident light (column 2, lines 63-66), which supports endpoint detection of a wafer under a polishing processing. Aiyer also teaches, ". . . a different wavelength, for example, in the visible spectrum is used)" (column 3, lines 41-44), which reads on, white light provides the lights of the different wavelengths and the endpoint is detected on the basis of a spectral intensity of the detected reflected lights of the different wavelengths, **in claim 27.**

It is the examiner position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu by using Aiyer's detection method for the purpose of improving insitu sensing of thin film thickness during CMP, providing enhanced detection sensitivity over a wide range of film thicknesses (Aiyer, column 2, lines 6-9).

Sandhu in view of Aiyer differs in failing to teach stopping polishing processing of said wafer on which the endpoint is detected, **in claim 9**.

Woo teaches an endpoint detection method wherein changes in the wafer surface is optically monitored and when the appearance of the wafer surface changes, an endpoint is signaled and polishing is stopped thereafter (page 2, lines 27-35).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu in view of Aiyer by using Woo's method of stopping the endpoint polishing process for the purpose of determining CMP endpoints on transparent layers such as an insulating oxide as well as on opaque metal layer (page lines 12-21).

Sandhu in view of Aiyer and further in view of Woo differs in failing to teach detaching the wafer whose polishing processing is stopped from said polishing processing machine, **in claim 9**.

Pollock teaches a polishing apparatus that is in an opened position, after removal of a semiconductor wafer from a polishing pad after completion of the polishing cycle (FIG. **3**; column 3, lines 1-5; column 4, lines 28-29 and 40-41 and Abstract).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu in view of Aiyer and further in view of Woo by using Pollock's method of removing a wafer from a polishing machine for the purpose of reducing the sticking of semiconductor wafers on a chemical mechanical polishing machine polishing pad (column 2, lines 6-9).

Sandhu in view of Aiyer and further in view of Woo and Pollock differs in failing to teach forming a new wiring pattern on said insulating film of the wafer is detached from said polishing processing machine.

Cadien teaches, "After completion of the CMP process, as shown in FIG. 3e, an interconnect line **324** (same as wiring pattern) is formed on ILD **302** (same as insulating layer) and on tungsten plug **322**. Interconnect line **324** can be formed by blanket depositing a conductive layer of, for example, aluminum alloys, tungsten, copper, etc., over ILD 302 and tungsten plug 322" (column 9, lines 45-50), which reads on forming a wiring pattern on insulating film of the wafer detached from said polishing processing machine.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu in view of Aiyer and further in view of Woo and Pollock by using Cadien's method of forming a

wiring layer for the purpose of fabricating of a planar, highly reliable, low resistance, high density electrical connection between two conductive layers of an integrated circuit (column 9, lines 62-65).

5. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu (US '846) in view of Aiyer (US '388), Woo (WO 99/30109), Pollock (US '521), and Cadien (US '975) as applied to claim 9 above, and further in view of Hiyama et al. (US 5,838,447).

Sandhu in view of Aiyer, Woo, Pollock, and Cadien differ in failing to teach a polishing rate of the film is evaluated on the basis of the intensities of said detected reflected lights so as to change dressing conditions of a dresser to a pad used for polishing processing on the basis of the evaluation result, **in claim 10** and wherein said dressing conditions include at least one of a dressing pressure **in claim 11**.

Hiyama teaches, "The computing unit **12** calculates the thickness of the oxide layer of the semiconductor wafer **2** from the sum value and compares the sum value with an initial value which has been stored, i.e., an initial value indicative of the intensities of light reflected from the semiconductor wafer **2** before it is polished, and calculates a polishing rate from the absolute value of the difference between the sum value and the initial value which are compared with each other (column 5, lines 6-15). The aforementioned reads on,

a polishing rate of the film is evaluated on the basis of the intensities of said detected reflected lights so as to change dressing conditions of a dresser to a pad used for polishing processing on the basis of the evaluation result.

Hiyama also teaches, "A constant polishing rate can be obtained by controlling the operating parameters (such as pressure exerted by the top ring or rotational speeds of the turntable and the top ring) of the polishing apparatus on the basis of the obtained data. Further, a service life of the polishing cloth can be judged or estimated, an a dressing parameter for dressing the polishing cloth after the polishing process can be also determined" (column 5, lines 34-42), which reads on,

wherein said dressing conditions include at least one of a dressing pressure.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu, Aiyer Woo, Pollock, and Cadien by using Hiyama's polishing detection method for the purpose of reducing polishing time and labor (column 2, lines 14-16).

6. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu (US '846) in view of Aiyer (US '388), Woo (WO 99/30109), Pollock (US '521) and Cadien (US '975) as applied to claim 9 above, and further in view of Birang (US '643).

Sandhu in view of Aiyer, Woo, Pollock, and Cadien differ in failing to teach the light is UV light.

Birang teaches a method of directing a light beam toward the layer during polishing and monitoring the light reflecting off the substrate (Abstract) and employing a wavelength anywhere from the far infrared to ultraviolet (column 17, lines 45-47), which reads on, irradiating the surface of said wafer under polishing processing with a UV light light as taught by Birang for the purpose of removing less material during a polishing cycle (column 17, lines 52-60).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sandhu in view of Aiyer, Woo, Pollock, and Cadien by using UV light as taught by Birang for the purpose of removing less material during a polishing cycle (column 17, lines 52-60).

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable reached on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-972-9310 for regular communications and 703-972-9311 for After Final communications.

ltue
July 28, 2003

GEORGE GOUDREAU
PRIMARY EXAMINER